UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Summary Review of Monthly Reports*
for
SOIL CONSERVATION SERVICE RESEARCH**

NOVEMBER 1944

EROSION CONTROL PRACTICES DIVISION

Conservation Experiment Stations Section

R. E. Dickson of Spur, Texas reports: "For 18 years two areas cropped to continuous cotton have furnished conclusive evidence that when conservation measures, such as closed level terraces, are applied crop yields are increased. These areas, one where the rows run with the slope and the other with closed level terraces, have had an average annual runoff of 1.82 inches and zero inches, respectively. Average acre yields over the same period of years have been 126 pounds of lint cotton per acre for the area with rows sloping and 184 pounds for the area with closed level terraces."

H. L. Borst of Zanesville, Ohio reports: "A good share of the month was devoted to inspection of field trials of trash-mulch seedings of alfalfa in 11 Districts in eastern and southeastern Ohio. On the whole, these trials are very encouraging and some of them are spectacular, to say the least. Although there is no reason why unproductive areas in this part of the State will not grow alfalfa and other legumes when supplied with essential lime and fertilizers, nevertheless it is somewhat surprising to see broomsedge and poverty grassland changed to a dense stand of alfalfa, other legumes, and grasses in a few short months. Of the 60 trials reported to date, 14 are outstanding (successful), 19 are good, 12 are fair, 7 are poor, and 8 are failures. The failure can be mostly explained by poor preparation, insufficient liming, or drought. In fact, extremely dry weather in July and August injured all seedings and it is surprising that as many came through as did."

C. J. Whitfield of Amarillo, Texas reports: "Soil moisture samples obtained during the period showed good moisture on fallow to a depth of five feet. There was little apparent difference in moisture for clean and stubble fallow. Nor was there a significant difference in soil moisture for the different tillage methods used for continuous wheat, but there was significantly more moisture in all but the surface six inches of fallowed land as compared to continuous wheat. On continuous wheat, moisture was favorable to two feet, compared to more than five feet on fallow. With average winter and spring rainfall, our wheat on fallow should yield somewhere near 20 bushels per acre, whereas, wheat after wheat has possibilities of around 10 bushels per acre.

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**All Research work of the Soil Conservation Service is in cooperation with the various State Experiment Stations.

"Tillage to kill growing weeds before seeding grass is desirable; however, it leaves the seedbed loose and exposes the surface to wind erosion. Packing will firm the seedbed but in early spring, it greatly increases the wind erosion hazard. The firmness of the various seedbeds was measured by a 'soil firmness tester' developed for this purpose. Relative compaction is measured by the depth of penetration into the soil of a rod probe 3/4 inch in diameter when pressures of 15 and 30 pounds are applied. The following table gives the results of the seedbed compaction readings and the grass stand counts:

Item	Average penetration in inches (15-lb. pressure)	Average penetration in inches (30-lb. pressure)	Established* grass plants per M^2
Undisturbed stubble...	.18	.98	7.2
One-wayed and packed..	.26	.89	13.4
One-wayed, not packed.	3.69	4.32	9.1

*All of the plots were seeded to a mixture of 8-1/2 pounds of blue grama and 1-1/2 pounds of buffalo grass seed per acre.

"As noted in the table, there was only a small difference in the firmness of the seedbeds between the undisturbed stubble plot and the one-wayed and packed plot, while the one-wayed and not packed plot had a very loose seedbed. In this test, the value of a firm seedbed free of growing weeds established by one-waying and packing is clearly demonstrated. One-waying to kill growing weeds improved the stand to a limited degree even though the seedbed was extremely loose. Clean tillage and packing in early spring are hazardous under some conditions but did not result in wind erosion damage in 1944. All of the plots have sufficient cover to prevent soil movement in the winter of 1944-1945."

George W. Hood of Batesville, Arkansas reports: "A day was spent in the field inspecting trial plantings of lespedeza sericea. This is a crop that gives evidence of being of considerable importance in this section, especially for hay and seed. The farms of Ernest Hook of Pleasant Plains, Arkansas; S. A. Brown of Almond, Arkansas; Chester Ferguson and M. L. Webb of Floral, Arkansas were visited and the lespedeza sericea inspected. The fields varied in size from one and one-half acres to three acres and with three to four per cent slopes. The earliest plantings were made on April 20 and the latest on May 30, 1944. Hulled and scarified seed was planted and the soil fertilized with phosphate at the rate of one hundred to two hundred pounds per acre. The soil was plowed and harrowed in all cases and the seed planted at the rate of twenty pounds per acre. Good to excellent stands were found on all fields with the number of plants per square foot ranging from four to ten. One field was cut for hay this fall, producing three-fourths ton per acre. All other fields were clipped but no yields were taken.

"From these trials it appears that sericea can be successfully grown in this section and will give a valuable hay crop and in a degree be a substitute for alfalfa, which is not profitable in this hill section. The seed crop also has possibilities. Further test and more plantings will be made to continue these studies. If lespedeza sericea can be grown successfully and profitably it will produce a leguminous hay crop to substitute for alfalfa, the lack of which is keenly felt in this section."

O. K. Barnes of Laramie, Wyoming reports: "The grazing study on several seeded grass pastures at Archer has been summarized. This study was started in 1941 by the Nursery Division in cooperation with the Archer Station and SCS Research.

"Six units, approximately 4 acres each, were established on cultivated dryland. These were seeded in the spring of 1941. The units or pastures were seeded as follows: Fairway Crested Wheat, Standard Crested Wheat, Russian Wild Rye, Western Wheat, Blue Grama and Buffalo Grass, and the sixth pasture to a mixture of these species. Experimental grazing started in 1942.

"The plan of grazing followed has been to use both crested wheat strains, western wheat and the grass mixture from April 16 to early June and to maintain a stocking rate that would fully utilize these grasses during this period because they generally become coarse after early June. Russian wild rye is used as an early summer grass immediately following crested wheat and the other early spring grasses. This pasture is stocked to fully use the available feed in about 30 days or up to about July 15. The seeded blue grama and buffalo grass pasture is used from around July 15 into September or immediately following the Russian wild rye. Per cent utilization has been kept as comparable between pastures and years as possible. Clippings, height measurements of the forage, daily lamb gains, and observation have been the bases for determining this.

"The following summary can be made: (1) Crested wheat for early spring use by sheep has been significantly better than a grass mixture, western wheat, or Russian wild rye. (2) The Fairway strain of crested wheat has produced slightly heavier lambs than the Standard strain. (3) Russian wild rye may fill a need for a good early summer pasture. (4) The blue grama and buffalo grass pasture, which was western Kansas seed, has made an excellent summer-fall pasture and has supported about 2 times as much grazing as the native range. (5) If the results from the best early spring grass, Fairway strain of crested wheat, Russian wild rye for early summer pasture and the blue grama-buffalo grass pasture following that and into the fall were combined, the combination would provide 6 or 7 months grazing for more than 2 times as many sheep as the native range supported. In other words, 124 acres of this combination would carry 100 head of ewes with lambs for 6 months, whereas it would require 256 acres of good native range. The acreage proportion used for this is 36 per cent in crested wheat, 20 per cent in Russian wild rye, and 44 per cent in blue grama-buffalo grass."

Oren R. Neal of New Brunswick, New Jersey reports: "During the 1944 crop season the yield of seven other farm crops on eroded and uneroded areas was measured. The crops studied included barley, rye, oats, soybeans, corn, wheat, and alfalfa. Yields of the oats and soybean crop were measured on only one farm each. For all the other crops listed, yield comparisons were obtained from two farms. The yields averaged in all cases where there were two locations are shown in the following table:

Yields of seven field crops from eroded and uneroded areas

Crop	Eroded		Uneroded	
	Grain Bu./A	Straw or hay T/A	Grain Bu./A	Straw or hay T/A
Barley.....	25.4	0.48	52.2	1.10
Rye.....	13.9	1.09	30.9	2.35
Wheat.....	14.3	.84	32.1	1.78
Corn.....	50.0	--	70.8	--
Oats.....	20.6	.51	32.4	.63
Soybeans.....	3.8	--	17.7	--
Alfalfa.....	--	1.07	--	1.92

"These yield differences must necessarily be considered as only tentative due to the small number of locations from which measurements were taken. However, the data indicate that the relative increases in yield from uneroded areas as compared with eroded areas is greater with these crops than has been found with potatoes. This may result from the fact that the crops listed are ordinarily fertilized at a much lower rate. Crop growth and yield in such cases are more dependent on residual effects of fertilizer than on inherent fertility of the soil. The ability of these soils to support crop growth has been materially reduced in all cases where serious erosion has occurred."

Joel E. Fletcher of Tucson, Arizona reports: "In the study of the effectiveness of a shallow subsoiling to remedy the tight condition in the upper subsoil of the soils in the Flagstaff area, the subsoiled sites averaged 1.6 acre inches more water used than the unsubsoiled sites. This was an average increase of 37 per cent in the amount of water available to mature the bean crops. The difference in yields averaged 89 pounds per acre or 18 per cent increase due to the practice, or an increase of 1 per cent in beans per 2 per cent increase in the moisture used by the plants."

Orville E. Hays of LaCrosse, Wisconsin reports: "In order to determine the effect of organic matter treatments on runoff and percolate, an experiment was established on the lysimeters in which the following treatments are applied; green manure plowed under, green manure plowed under plus 8 tons per acre of barnyard manure surface applied, and green surface applied or subsurface tillage. Last year all plots were in clover-timothy hay. In the fall four plots were spaded with all surface growth turned under and two plots were worked below the surface producing a

condition that would be similar to land worked with sweeps, in that all of the above surface growth was left on the surface. During the year the plots on which the green manure was surface applied were worked in such a way as to leave as much of the organic matter on the surface as possible. The other plots were hoed. All plots were worked frequently enough to keep the weeds under control.

"During the winter months plots which had green manure on the surface lost about twice as much of the precipitation as runoff as the plots on which the green manure was spaded under. It seemed that the green manure protected the soil so that it did not thaw as rapidly as surface free of raw organic matter. Plots with green manure on the surface lost 1.24 inches of runoff, and plots with green manure plowed under lost 0.64 inches. During the frozen period there was no percolate, of course.

"During the frost free period the relative loss by treatment was reversed. That is, the plots on which the green manure was spaded under lost more runoff than the subsurface tilled plots, which is in line with what might be expected. The green manure on the surface kept the soil open and porous so that rain could be absorbed by the soil. This resulted in decreased runoff and increased percolate. The 8 tons per acre of barnyard manure resulted in a slight increase in runoff and percolate over plots receiving no barnyard manure. The data for the year are included in the following table:

Runoff and percolate in inches (average of duplicate plots)

Item	Green manure surface applied	Green manure plowed under	Green manure under plus 8 tons per acre of barnyard manure
Runoff frozen period.....	1.24	0.63	0.64
Runoff frost free period...	1.04	2.29	2.54
Percolate frost free period...	1.96	0.07	0.10

C. A. Van Doren of Urbana, Illinois reports: "The interception of rainfall for July and August by the corn on the contour farming plots was 23 per cent of the total rainfall of 6.91 inches during this period. The interception of rainfall by the corn during the period September through November 15 was only 13 per cent of the total rainfall of 4.92 inches. The decreased interception of rainfall during the fall period was due to maturity of the plants and subsequent loss of leaves."

Carl L. Englehorn of Fargo, North Dakota reports: "During the past two seasons quite a little weed growth occurred on the tillage plots which had been in continuous wheat since the plots were laid out. During the 1944 season the Langdon plots produced the fourth and the Edgeley plots the fifth successive wheat crop. In order to determine possible differences in weed growth as between tillage practices, weed counts were made during the 1943 and the 1944 seasons. The weeds from three quadrats were harvested from each tillage plot, the plant materials oven-dried and weighed, and the results calculated in terms of pounds an acre. Although these data are not inclusive of the entire season's weed growth, they indicate comparative weediness between plots as of the particular sampling date.

"At Edgeley the greatest growth of weeds occurred during the 1943 season. Seeding in the spring of this year was followed by a period of cool rainy weather during which period weeds appeared to grow more rapidly than did the wheat crop. The main offender this season was the horseweed (Erigeron canadense), commonly found in waste areas. It's growth appeared to vary directly with the amount of plant residue left on the soil surface, from an average of 1137 pounds an acre on the stubble mulch plots to an average of 3 pounds an acre on the plowed plots. Wheat this year averaged 8.2 bushels on the stubble mulch plots and 15.9 on the plowed plots.

"It appeared that from the standpoint of weeds, especially under stubble mulch tillage, wheat could not be grown successfully for more than four successive years. However, the plots were again tilled and seeded to spring wheat in the spring of 1944. During this season about the normal growth of weeds occurred. The horseweed disappeared almost entirely from all but the burned, non-tilled plots, where they decreased considerably. Total weed growth, consisting mostly of pigeon grass (Setaria viridis) and wild buckwheat (Polygonum convolvulus) ranged from 123 to 776 pounds of dry plant material an acre. The average total weed growth was 236 pounds on the stubble mulch and 319 on the plowed plots. The average yield of wheat was 26.7 bushels, both on the plowed and the stubble mulch plots. At the Langdon Substation weed growth sppears to be independent of the type of tillage."

Edgar C. Joy of Brookings, South Dakota reports: "Average crop yields for the past 5 years of the tillage plots on the Lemke farm near Huron are as follows:

Lemke Farm (Average yield in bushels per acre 1940-1944)

Item	Wheat	Oats	Corn
Fall plow.....	21	48	23
Fall subsurface.....	20	48	24
Fall double disc.....	20	47	21 Basin list
No tillage.....	17	44	--
Spring plow.....	19	47	22
Spring subsurface.....	20	43	21
Spring double disc.....	19	40	17 Spring list

"Yields are much alike except for a few poor practices such as no tillage, listing for corn and discing wheat stubble in preparation for oats. Soil blowing has been experienced nearly every year on the fall plowed plots. Fall subsurface tilled plots did not blow at any time. Weeds have been a problem on the subsurface tilled plots, especially so, the past two seasons. Plowing has given best weed control. Cost of operation is lower on the subsurfaced plots than on the plowed plots, hence net returns would be highest where subsurface tillage is practiced."

Harley A. Daniel of Guthrie, Oklahoma reports: "The effect of the direction of cultivation and terraces on the conservation of runoff water has been studied during the last three years at the Wheatland Soil Conservation Experiment Station, Cherokee, Oklahoma. The station is located on deep, permeable soil and the results for the crop year (July 1 to June 30) are as follows:

Effect of the direction of cultivation and terraces on runoff at the Wheatland Soil Conservation Experiment Station, Cherokee, Oklahoma

Rainfall and cultivation	1942	1943	1944	Average	Pct. of difference
	Precipitation 1/ (Inches)				
Total rainfall.....	30.03	20.28	20.33	23.55	
	Runoff (per cent)				
With slope.....	15.2	5.5	14.4	11.7	
Contour.....	13.0	4.4	12.3	9.9	15
Terrace - Contour.....	9.1	3.4	9.8	7.4	37

1/ The average annual rainfall compiled by the Weather Bureau in Cherokee, Oklahoma, since 1915 is 25.92 inches.

"These results show that contour cultivation reduced runoff water loss an average of 15 per cent during the crop years of 1942, 1943, and 1944. During the same period, however, terraces and contour cultivation conserved 37 per cent more water than land cultivated with the slope.

"Draft tests were conducted on all tools used for wheatland tillage at the Cherokee Station. Test runs were made with each tool over a 300-foot measured distance. All the tools, except the moldboard plow and the one-way wheatland disc, were mounted on the same carrier bar. The depth of cut was adjusted to give as nearly as possible the same cut or to give the proper land treatment for the particular tool. Part of the tools were tested on wheat stubble land with a moisture content of approximately 9 per cent, some of these and the remaining tools were tested later on the alfalfa field below the railroad with a moisture content of approximately 14 per cent. The draft requirements of the sweeps were much higher in the alfalfa stubble as compared to other tools when tested on wheat stubble land.

"The draft requirements of the tools tested in pounds pull per square inch of furrow slice are as follows:

For wheat stubble -	radex sweeps (concave surface up and cutting fin)	4.36
	radex sweeps (convex surface up)	5.25
	grader blade sweep	5.61
	8-foot blade	5.60
	lister	7.88
	basin lister	10.88
For alfalfa field -	one-way disc	7.72
	plow lay sweep	8.42
	radex sweep (concave surface up)	8.51
	radex sweep (convex surface up)	10.33
	grader blade sweep	10.49
	Pence sweep	10.90
	14-inch moldboard plow	10.05

Glenn M. Horner of Pullman, Washington reports: "The results obtained in 1944 from the field trials near Davenport, Washington have been summarized. The trials were to test in a summer fallow area the effect of ammonium sulfate on wheat yields where wheat straw had been returned to the soil. There have been indications of marked yield depressions following the utilization of straw in the conservation program. The data given below are average of trials in 19 locations.

Effect of ammonium aulfate on wheat yields

Description of soil	No. of location	Increase over check plots			
		65 lbs. ammonium sulfate per acre		125 lbs. ammomiun sulfate per acre	
		Grain	Straw	Grain	Straw
		Bu./A	T/A	Bu./A	T/A
Walla Walla soils (upland)...	4	3.4	0.16	5.7	0.32
Athena soils (upland).....	8	5.5	0.31	7.3	0.42
All upland soils.....	14	4.4	0.25	6.9	0.38
(a) class 1 erosion.....	4	3.0	0.17	4.2	0.33
(b) class 2 erosion.....	7	4.7	0.28	6.5	0.39
(c) class 3 erosion.....	3	5.7	0.28	11.7	0.47
Cheney and Davenport soils, (bottomland).....	5	2.5	0.26	0.0	0.10

"The results show that the yield depression caused by the utilization of straw can be taken care of by the use of a nitrogen fertilizer. Greater availability of fertilizer at lower prices after the war will do much to encourage the use of straw for erosion control. A significant fact obtained from these trials is that the response to fertilizer increased with the severity of the degree of erosion."

T. C. Peele of Clemson, South Carolina reports: "The nitrate nitrogen data from the corn mulch plots for 1943 and 1944 were recently summarized and the results are presented in Tables 1 and 2. There were apparently no significant differences in the soil nitrate content as a result of the three tillage methods: mulching, disking and plowing. During both years an adequate supply of nitrates was present on all of the cover crop plots during the early part of the corn growing season, with a deficiency of nitrates appearing the latter part of July in 1943 and in September 1944. The corn in 1944 was planted about a month later than in 1943 due to weather conditions. In 1943 there were no significant differences in corn yields, but in 1944 the yields from the mulch plots were significantly greater than the yields from the plowed plots, with the yields from the disked plots intermediate between the others. The nitrate data show that the differences in 1944 could not be attributed to available nitrogen and in our opinion the increased yields from the mulch plots were due to moisture conservation.

"Table 1.-Effect of cover crops and tillage methods on nitrate nitrogen content of soil, 1943

Cover crops	Tillage method	Nitrate nitrogen in soil				
		May 18	June 3	June 22	July 28	Aug. 30
		ppm	ppm	ppm	ppm	ppm
Vetch and rye	Mulched	9.1	13.4	14.3	1.9	2.7
	Disked	12.1	13.6	17.5	1.8	2.8
	Plowed	11.2	12.1	14.7	1.5	2.2
Crimson clover	Mulched	11.9	11.2	13.6	1.8	2.7
	Disked	11.6	17.1	16.4	1.9	2.6
	Plowed	12.8	14.2	15.5	1.2	3.0
None	Plowed	7.9	10.8	11.0	1.7	2.3

"Note: Corn planted April 30.

"Table 2.-Effect of cover crops and tillage methods on nitrate nitrogen content of soil, 1944

Cover crop	Tillage method	Nitrate nitrogen in soil				
		May 8	June 13	July 10	Aug. 4	Sept. 21
		ppm	ppm	ppm	ppm	ppm
Vetch and rye	Mulched	12.1	29.2	14.4	14.7	2.2
	Disked	15.9	34.6	13.3	6.1	2.4
	Plowed	11.7	28.0	15.4	12.5	2.3
Crimson clover	Mulched	15.5	36.5	13.3	12.8	2.0
	Disked	13.5	36.0	22.7	20.7	3.3
	Plowed	11.3	44.0	19.0	13.7	3.4
None	Plowed	12.5	13.5	10.9	6.1	1.9

"Note: Corn planted May 23."

Dwight D. Smith of Columbia, Missouri reports: "Fertilized timothy, sweet clover, and lespedeza produced 251 pounds beef per acre this year--only 10 pounds per acre more than fertilized timothy-lespedeza, but 70 pounds per acre more than fertilized wheat-lespedeza. The 5-year average for these grass-legume areas is practically the same as that for wheat-lespedeza. Returns from bluegrass areas this year were a little less than one-half that from the other grazing areas. The highest return from spring and fall grazing of winter barley was secured this year when it was 190 pounds beef per acre."

Hillculture Section

V. T. Stoutemyer and F. L. O'Rourke of Glenn Dale, Maryland report: "During the past several years a number of experiments have been conducted here which indicated that cuttings could be rooted under artificial light, without greenhouse or frame facilities, more rapidly than with the conventional methods of the present day. The high efficiency and low operating cost of fluorescent lamps make them ideal for this purpose, and some highly successful experiments on the rooting of Cinchona, hollies, sour orange, Diervilla and others.

"In this system of propagation, natural daylight is excluded, and since there are no fluctuations in the light, humidity may be maintained at any point up to atmospheric saturation without any special apparatus. The rooms in which the cuttings are rooted may be located underground, and thus may be heated at very low cost. This method of propagation has some quite revolutionary implications, and possibly in the future, greenhouses or outdoor frames for propagation may be largely displaced.

"Some idea of the costs of operating may be obtained from the following figures. A thirty watt fluorescent lamp placed above a bed of cuttings at a distance of about one foot when operated for 16 hours per day uses 480 watts per day. At 2-1/2 cents per K.W. this would be 1-1/4 cents per day for the unit, which would be ample for illuminating about 600 cuttings of holly or about 1,000 cuttings of a type such as yew or boxwood. Since few types of cuttings would be in the propagating frame for more than four to six weeks the operating cost for lights would not be over 50 cents for a lot of cuttings of this type. Cuttings of most florists plants would not be in the frame much over two weeks."

DRAINAGE AND WATER CONTROL DIVISION

Drainage Studies

Drainage of Sugarcane Land, Baton Rouge, Louisiana - I. L. Saveson reports: "On November 28, Professor Carter and the writer made an inspection of moled areas now in summer-plant cane on the Cinclare Plantation after heavy rains. Moles were functioning, running water. Areas which were moled showed better drainage, the surface of cane row checked, while undrained areas surface was smooth and saturated. Cane also seems to have a better color and more growth on the moled areas against the unmoled areas. Some water was standing in the middles in the areas which were not moled while in the moled areas there was practically no water standing.

"Further field inspections are contemplated as soon as weather permits digging into mole channels, especially some that have been in two years.

"Yields on moled areas installed two years are indicated on the next page. There is quite a variance in the yields of the check plots and arrangements have been made with Dr. C. T. Dowell, of the University, to go over the area in order to try and pick out comparable check plots as soon as weather permits.

"The weather for November was rainy with a total rainfall of 7.89 inches.

"Mr. Alfred T. Chappius, of Lima, Peru, visited this area and was interested in mole drainage and the dragline with side-arm attachment."

Mole Drainage in Pennsylvania, State College, Pennsylvania - E. B. Kinter reports: "Mole-drainage installations were made on several sites in the State. In Clarion County, working in cooperation with District personnel, four sites were moled. These involved Cavode, Armaugh, and Ernest soils and had been selected earlier. A two-wheel machine made by the Kellefer people and a skid-type machine constructed at State College were used. Channels secured at all sites were promising, but several operational difficulties were encountered. These have been overcome to the extent that the skid-type machine will be used exclusively for future operations, as it is evident, from plaster casts of the channels, that an excellent opening in plastic subsoils can be obtained with this implement. Channels were installed at 18 to 24-inch depths and 6 to 12-foot spacings, and it is planned to place others at depths to 30 inches.

"Similar installations were made in Pontour County on two glaciated soils with very plastic substrata. Here, it was necessary to use both a small Cletrac and a rubber-mounted tractor for power, while in Clarion County we had been fortunate in having the use of a heavy Cletrac belonging to the Soil Conservation Service district.

"Several sites were examined in Somerset County for possible installation in December. As a part of the Allegheny Plateau, this county contains a considerable area of land having imperfect or poor drainage and plastic-subsoil conditions where mole drains may be feasible."

CINCLARE PLANTATION, CINCLARE, LOUISIANA

SECTION 14
Weights by R. T. Gibbens, Field Supt.

VARIETY C.P. 33-243
Harvest 1943, 11/13 to 11/16 inclusive, as plant cane.
Harvest 1944, 11/2 to 11/3 inclusive, as 1st year stubble.

Plot No.	Plot on Turnbull's Map	Description	Pounds Cane	Tons per Acre		Brix		Sucrose		Purity		Sugar per ton		Sugar per acre	
			1944	1943	1944	1943	1944	1943	1944	1943	1944	1943	1944	1943	1944
1	F	Check	35,520	20.54	8.22	15.54	16.00	11.65	12.71	74.96	79.46	153.7	173.5	3157	1426
2	E	Check	36,400	22.00	8.13	15.02	16.10	11.33	12.84	72.14	79.75	150.3	175.7	3306	1428
3	D	Check	52,680	22.23	12.78	15.34	15.53	11.51	12.38	75.06	79.71	152.2	169.3	3382	2164
4	C	Moled over tile outlet *	41,820	20.42	10.16	15.17	15.93	11.91	12.63	78.58	79.26	161.5	172.3	3298	1826
5	B	Tile outlet **	41,600	21.09	11.6	14.58	14.87	11.06	12.41	75.85	83.47	146.4	174.2	3088	2020
6	A	Moled over tile outlet	60,740	16.01	14.43	15.47	15.28	11.76	12.78	75.72	83.64	154.2	173.5	2469	2589

*4 tile mole outlets from Cut C cross this cut and also provides outlets for mole lines in Cut A.

**Cut A is next to main drainage channel and had spoil spread over it from dredging main channel.

According to Field Superintendent Gibbens weed conditions and stand approximately same for all cuts. Stand was the same for years 1943 and 1944.

No winter kill.

(Baton Rouge, Louisiana)

The Everglades Experiment Station, Belle Glade, Florida - C. Kay Davis reports: "We are continuing with dragline work in Section 10 at the Experiment Station. The dragline operator, however, has only been able to work half time because of high water in the ditch. The Experiment Station has begun constructing the three laterals which Mr. Clayton designed for the experimental studies, which were designed to determine the effect of ditch spacing on water control on group yields. These ditches were spaced at 1/8 and 1/4-mile intervals.

The Everglades Project at Ft. Lauderdale, Florida - C. Kay Davis reports: "We have succeeded in getting two fairly intelligent Indians, and with these two and an older man whom we employed a month or so ago we will be able to again resume our topographical surveys. During the past two weeks we have used the engineering party, together with the shop crew, to construct a frame structure at the mouth of Indian Run, so that field parties working in this area will have some place to stay over night. The air boats have been repaired and reconditioned and will be shipped back into the Hillsboro Lake area on Monday, December 4, and the engineering field party will then resume their work in this area. This should be done while the water table is high enough to float the air boat and complete the east and west line which we started across this area last year. This will then give us enough information to get a general idea of the topography in the Hillsboro Lake area.

"The topographical work done by the Dade County Engineering Section and the Istokpoga Drainage District is being checked now so that we can take advantage of the work already done for completion of our topographic map.

"Cross sections were obtained of the South New River Canal and State Road 25 Cross Canal.

"The engineer for the Everglades Drainage District has expressed his intention of submitting an action program to the Everglades Drainage District Commissioners which will include the installation of dams and dikes for regulating water stages in the outlet canals. This action-program report, however, is being delayed pending the completion of the first draft of our report. Probably nothing further will be done toward writing the report for the District Commissioners until after the meeting of the Advisory Committee. Mr. Wallis is much encouraged over the solutions to some of the problems which Mr. Lewis Jones suggested at the time of his recent visit to Fort Lauderdale, and it is his intention to base his report on the conclusions which will be submitted in our report."

"Records from the six aerial gages are being recorded semi-monthly in accordance with the procedure of the study of water-table conditions in remote areas of the Everglades."

Sedimentation Studies

C. B. Brown reports: "A plan for sediment control at the head of Loch Raven Reservoir water-supply sorage reservoir for the City of Baltimore, Md., was prepared by L. C. Gottschalk at the request of the Baltimore Bureau of Water Supply. The plan involves diversion of sediment-laden inflow waters on to marshy areas at the head of the reservoir and forcing

them to deposit their sediment load by means of vegetative screens. On November 8, C. B. Brown, S. B. Detwiler, and L. C. Gottschalk conferred with officials of the Bureau of Water Supply and made an inspection of plantings already made at the head of the reservoir. The Office of Research will conduct experimental plantings in the area to determine suitable species of plants to be used in the vegetative screens while all work connected with installation of screens, construction of diversion dams, etc., will be done by the Bureau of Water Supply. The Bureau of Water Supply will also make detailed surveys of the area to determine the effectiveness of the screens in reducing sedimentation in active storage space and to obtain other data useful to the Service in developing similar sediment-control measures at other reservoirs in the country. Sediment-control measures are needed in many cases to protect reservoirs until soil-conservation programs can be completed on contributing watersheds.

"At the request of the Regional Office at Upper Darby, Pa., L. C. Gottschalk was assigned to work with L. M. Glymph, Jr., Zone Technician, in making sedimentation surveys of three reservoirs owned by the P. H. Glatfelter Co., at Spring Grove, Pa. These reservoirs, located in the Codorus Creek watershed and in the York Soil Conservation District, are used principally in the manufacture of paper vital to the war effort. The oldest reservoir, which was built in 1884, was dredged in 1942 to a prevailing depth of 6 feet to increase its storage capacity. In the 2-year period up to November 1944, an average of 2 feet of sediment was deposited over the entire bottom of the reservoir reducing the average depth to 4 feet. A smaller reservoir constructed by the company in 1937 was surveyed in 1939 in connection with the U.S.D.A. Flood Control Survey in 1939. This survey showed that the reservoir was silting at a rate of 3.03 percent annually and that the rate of sediment production from the 2.91 square miles of watershed above it amounted to 45.6 cubic feet per acre annually. The average sediment depth in the reservoir in 1939 was 0.44 feet. The resurvey in November 1944 showed that an average depth of sediment amounted to 1.75 feet. The rate of sedimentation has been reduced in the past 2 years, however, by the construction of a new reservoir above, which controls the runoff from about 85 percent of the watershed. The new reservoir, completed in 1942, is silting at a slow rate because of the large amount of storage which has been developed in relation to the size of the drainage area. At least three-fourths of the watershed area above these reservoirs is in cultivation and much of the sedimentation damage can be reduced by proper conservation practices."

Sediment Studies of the California Institute of Technology, Pasadena, California - Vito A. Vanoni reports: "Preparation for measuring the amount of stream-bed scour in the Simi Wash were completed and the necessary field work was done. The method used is to inject columns of dye at various points in the stream bed, thus forming columns of dyed sand. After the flood these points are excavated until dyed sand is encountered, thus locating the lowest depth of scour. Dye injections of this kind were made at three cross sections representing a typical straight section and two typical curve sections. The reason for wanting to know the maximum scour is to get information that can be used to design stream-control structures, especially revetments.

"Density-current phenomena were demonstrated to several visitors to the laboratory. Considerable time was spent in planning further experimental studies of density-current phenomena of importance to soil conservation.

"Revetment experiments were carried out in the laboratory flume with a revetment parallel to the flow direction. In this experimental apparatus water carrying a heavy sediment load is circulated, thus giving a heavily-laden model stream. The working section of this apparatus is on a stream bed of the same material being carried by the flow. The preliminary results of experiments with revetments parallel to the stream showed that there was a tendency to induce deposit at the revetment and push the stream away from the revetment. Flow through the revetment deposited material, thus building up the bank. This deposit, which built up to about the water level protected the revetment by relieving it of the water pressure. In connection with this study some experiments were made in the 10-inch flume in the main laboratory.

"Three days were spent in the field by a member of the laboratory staff studying sedimentation problems in the Wildwood Wash near Yucaipa, California. During this time a flood of major magnitude occurred on this Wash and afforded an opportunity to observe heavily-laden flows. This study was made at the request of the Operations technicians who are planning control works for this Wash."

Hydrologic Land-Use Studies

North Appalachian Experimental Watershed at Coshocton, Ohio - L. L. Harrold reports: "During November, precipitation was 0.96 inch, amounting to 1.80 inches below normal. There was no runoff during the period and a number of local springs ceased to flow. In the runoff-analysis work there appeared significant differences between the results at Zanesville and those at Coshocton which are both supposed to be on Muskingum silt-loam soils. In discussing the matter with Dr. Borst, he indicated that there was probably a material difference in the internal drainage of the soils from the two stations. In order to determine this, samples were taken and laboratory work is now in progress on the analysis of the Zanesville watershed soils.

"Considerable work was done on the preparation of the Coshocton Research Findings to be presented at a Soil Conservation Service school for State Operations personnel, November 30 - December 1."

Central Great Plains Experimental Watershed at Hastings, Nebraska - I. W. Bauer reports: "Precipitation at the Meteorological Station was 1.70 inches, with 1.49 inches of rain and snow on the 25th and 26th of November. There was very little runoff at any of the stations.

"Plans had been made to start building terraces as soon as the corn was picked, but due to the storm, the picking was not completed. Since the storm the weather has been cold and the ground frozen, so the work will now have to be postponed until spring.

"The plots of corn were sampled with the following results from the 40-rod row samples:

	Ave. of two plots			Ave. of three plots
	Contoured	Straight Rows	Subtilled	Strip Crop
Grain, Bu./acre	46.0	29.8	23.4	37.9
Stover, Lbs./acre	4208	2475	2614	3973

"This was white corn, open-pollinated. The open-pollinated yields in this community were about the same as the hybrid corn, but the hybrids stood up much better.

"Work on the 1944 bulletin is progressing satisfactorily with the tabulations and computations of the small watersheds nearly completed."

Hydrologic Studies at LaFayette, Indiana - R. B. Hickok reports: "Total rainfall averaged 2.32 inches on the Throckmorton Farm and 2.70 inches on the Dairy Farm.

"Analyses of corn stalks for protein, phosphorus and potash, showed considerable variability but no significant differences between prevailing-practice and conservation-practice watersheds resulting from fertilization on the latter. It is believed that differences in nitrate recovery on watersheds within a treatment group may be considerably affected by drainage differences in the soils. Findings of other experimenters indicate that limitation of nitrates affect protein content of stalks before composition of grain is affected. It may be recalled from the previous report that there was little difference in protein content of corn grain from the four watersheds, two under prevailing and two under conservation treatment.

"Yields were reported by Operations field men on 14 pairs of plots, one of which was contour planted and the other planted up and down the slope. Of 11 paired plots in corn, the average of contour-planted plots was approximately 8 bushels higher than the average of up and downhill-planted plots. Two soybean plots showed contour drilled (solid) beans averaged 3 bushels higher than the paired plots drilled without regard to slope. Three pairs of fertilizer plots were also reported from one District and the results have been made available to the Experiment Station. A complete tabulation of the contour-test data has been given the State Conservationist and an analysis will be made in the near future and a report prepared for mimeographed release by the Experiment Station.

Hydrologic Studies at East Lansing, Michigan - R. G. White reports: "For the period, precipitation amounted to 1.74 inches at the cultivated watersheds, 1.71 inches at the stubble-mulch plots, and at the wooded watershed 2.00 inches, as measured in the standard non-recording rain gage. The average rainfall for the month, based on a 40-year record of the U. S. Weather Bureau, is 2.28 inches. Most of the November

precipitation fell as rain, but there were three light snowfalls during the period, none of which stayed on the ground more than a day or so. The lowest temperature for the month, as recorded at the cultivated watersheds, was 20° on November 30.

"Calibration curves were completed, showing the percent of moisture in the soil for each gypsum block according to the block resistance recorded. A calibration test was run on each block by Mr. Walter U. Garstka prior to the placing of the blocks in the soil. Individual curves were drawn for each block, and it is hoped that in the near future it will be possible to complete a set of curves correcting observed block resistances for temperatures."

Hydrologic Studies at Ithaca, New York - B-2 - John Lamb, Jr., reports: "No significant weather differences existed between the watershed areas and those around the Arnot Station. While snowfall appeared at the usual time of the year, the amount that fell was far in excess of previous years, and provided a good blanket (9 to 10 inches) with resulting thawing of the surface soil previously frozen.

"No appreciable runoff had occurred from any of the watersheds since last June. The snow blanket probably was responsible for releasing the stored moisture from previous rains in the partially frozen topsoil together with some snow melt, resulting in continuous light runoff from all watersheds. Runoff from the forest area started approximately 15 hours later than runoff from the idle-land area.

Precipitation	3.25" (station 9-year average 2.59")
Temperature, maximum	67°F
Temperature, minimum	18°F

Hydrologic Studies at Cherokee, Oklahoma - B-2 - H. A. Daniel reports: "The precipitation for the month was 2.04 inches. There were five storms but they were of low intensity and no runoff occurred from any of the plots or watersheds.

"The effect of the direction of cultivation and terraces on the conservation of runoff water has been studied during the last three years at the Wheatland Soil Conservation Experiment Station at Cherokee. The station is located on deep, permeable soil and the results for the crop year (July 1 to June 30) are as follows:

Effect of the Direction of Cultivation and Terraces on Runoff at the Wheatland Soil Conservation Experiment Station, Cherokee, Oklahoma

Rainfall and Cultivation	1942	1943	1944	Average	Percent of Difference
	Precipitation[1] (Inches)				
Total rainfall	30.03	20.28	20.33	23.55	
	Runoff (percent)				
With slope	15.2	5.5	14.4	11.7	
Contour	13.0	4.4	12.3	9.9	15
Terrace - Contour	9.1	3.4	9.8	7.4	37

[1] The average annual rainfall compiled by the Weather Bureau in Cherokee, Oklahoma, since 1915 is 25.92 inches

"These results show that contour cultivation reduced runoff water loss an average of 15 percent during the crop years of 1942, 1943, and 1944. During the same period, however, terraces and contour cultivation conserved 37 percent more water than land cultivated with the slope."

Microbiological Studies at Lincoln, Nebraska - F. L. Duley reports: "The microbiological work for the month has been confined chiefly to a continuation of laboratory studies. An article entitled 'Influence of Microorganisms and Some Organic Substances on Soil Structure,' by T. M. McCalla was accepted for publication in Soil Science."

Hydrologic Studies at College Park, Maryland - H. W. Hobbs reports: "A total of 7.09 inches of rain fell in September on 12 days. This is 121 percent above normal, and brings the accumulated precipitation since January 1 to 2 percent above normal. From 1 to 6 runoffs occurred on the watersheds. The peak rates of flow were recorded between 4:48 a. m. and 4:50 p. m. on September 13. These were caused by 3.22 inches of rain in 13.5 hours which had been preceded by .50 inch 14 hours earlier. Five-minute intensities were as high as 4.7 inches per hour. The following peaks and amounts of runoff for this storm and for the month occurred on the drainage areas:

Area No.	Acres	Land Use Sept. 13, 1944	Runoff Sept. 13, 1944 Peak in/hr.	Total in.	%(of 3.22")	Runoff Sept. 1944 Total in.	%(of 7.09)
W-I	8.22	Strip Cropping (approx. contour)*	.444	.5381	16.7	.5617	7.93
W-II	7.44	Planted up & down slope*	.865	.4908	15.2	.5725	8.08
W-III	6.06	Contour tillage-L. Beans 13.5%, Fallow 37%, SB 39.6%, Grass 9.9%	1.87	.8430	26.2	1.011	14.25
W-IV	6.11	Tillage up & down slope - Fallow 47.5%, Soybeans 39.5%, Grass 13%	2.97	1.3427	41.6	1.713	24.2
W-V	4.07	Approx. Contour, Sorghum, Wheat & Hay Stubble (above Div. Terrace)	.089	.2149	6.7.	.2154	3.06
W-VI	3.53	Pasture (no furrows)	1.43	.6253	19.4	.7512	10.6
W-VII	3.52	Pasture (20 ft. contour furrows)	.757	.4730	14.7	.5008	7.04
W-VIII	2.43	Cutover Woodland	.0025	.0052	0.16	.0052	0.07
W-IX	12.05	Mature Woodland	.0004	.0010	0.03	.0015	.02
W-X	3.04	Strip Cropping (exact contour) Sorghum & Hay (above Div. Terrace)	.228	.2635	8.2	.2643	3.73

3-year rotation, corn standing, wheat and hay stubble.

"The corn on W-I and II was sampled September 20 for stover yields and was bound and shocked on the fields September 23 to 28. The last of the lima beans were harvested on W-III on September 16. A rye-cover crop was drilled on 70 percent of W-IV and 15 percent of W-III. The edible soybeans on W-III and IV were not harvested due to thin stand. A start was made on the construction of broad base crop terraces on W-III by plowing with 2-bottom plow."

Hydraulics

Hydraulic Studies at Minneapolis, Minnesota - F. M. Blaisdell reports: "Studies of methods of recording fluctuating pressures in the pipe-bleeder model were continued. As a result of canvassing several instrument manufacturers it now appears that a suitable commercial instrument can be obtained for measuring pressures that fluctuate as much as 5 feet of water in the model in a period of less than one second. It is anticipated that this problem can be solved in the next month.

"On November 6 a copy of the report entitled 'Progress Report on Design of an Outlet Structure for Head Spillways' by Albert N. Huff was sent to Washington for reproduction prior to in-Service distribution.

"Mr. Donnelly has been studying rectangular-spillway outlets for the past month. The tests to date have been exploratory in nature. There are two problems here. First, the distribution of flow across the exit to the rectangular spillway is very poor and some means must be found of improving this flow distribution. Secondly, the destructive energy in the flow must be dissipated or controlled. At the resquest of the Operations Engineers, Mr. Donnelly has attempted to accomplish these ends with a low depth of tailwater. This necessarily complicates the problem. A long stilling basin containing numerous baffles and sills is indicated if the tailwater depth is kept low. A straight or slightly converging section may also be required between the spillway and the diverging stilling basin in order to improve the flow distribution. It now appears that it will be desirable to develop two stilling basin designs: A basin set low in the stream channel to provide a high tailwater; and another larger basin to be used where field conditions prevent the use of the former. The choice will be one of relative cost. The first studies are being made with a low depth of tailwater."

Hydraulic Studies at Stillwater, Oklahoma - V. J. Palmer reports: "The testing of vegetal-lined channels occupied the attention of the entire laboratory staff during this period. A mild, dry fall provided very favorable testing conditions. A heavy frost did not occur until the experimental work was completed. The computation of the data is going forward. Following is a summary of the channels tested:

Channel	Nominal Dimension Bed Slope	Bottom Width	Side Slopes	Cover	No. of Test Flows	Range of Discharges Min.	Max.
	Percent	Ft.	Horiz. to Vert.			cfs	cfs
U1	5	3	*	Good cover of Bermuda; medium long, green	7	.003	.13
U2	5	3	*	" "	17	.003	71.
U3	5	3	*	" "	17	.003	70.
U5	5	3	*	Good stand of weeping love grass; long, green	14	.004	24.
U6	5	3	*	" "	13	.004	14.
L-1A	4	10	4	Good cover of Bermuda; medium long, green	10	.58	126.
L-1B	9	10	4	" "	10	.58	126.
FC-4	2.5	10	6	Thin cover of Bermuda; medium long, green	5	1.2	24.

*Rectangular-shaped channels with vertical-plywood sidewalls in place only during the testing period."

Hydraulic Studies at Logan, Utah - C. W. Lauritzen reports: "Particular attention was given to the measurement of permeability and the swelling of bentonites which accompanies wetting. Measurements on several bentonite samples obtained in connection with the recent survey made to determine the occurrence and nature of bentonites in Utah showed a wide variation in both the permeability and swelling properties of materials classified as bentonites. In general decreased permeability was associated with increased swelling.

"The addition to bentonite decreased the density to which a sandy-loam soil could be compacted as evidenced by the following data:

Material*	Lbs. per cu. ft. (dry weight basis)
Sandy Loam soil alone	124
Sandy Loam soil 100 parts, Redmond Bentonite 2 parts	119
Sandy Loam soil 100 parts Redmond Bentonite 5 parts	115
Sandy Loam 100 parts Redmond Bentonite 10 parts	107

*Materials were compacted at approximately optimum moisture.

"Employing a 4 to 5-inch blanket consisting of mixtures of a sandy-loam soil 100 parts, and bentonite 1 part, consolidated by water without compaction, a coefficient of permeability of 26 feet per year was obtained as compared to 1,485 feet per year with the sandy loam alone. Compacting the sandy loam reduced the permeability to approximately 500 feet per year. Mixtures containing 2 parts of Bentonite to 100 parts of sandy loam resulted in a coefficient of permeability of 27 feet per year as compared to 93 feet per year after compaction. This might possibly be explained by the fact there was some leaching of bentonite by the percolating water. A mixture of sandy loam 100 parts and bentonite 5 parts placed without compaction resulted in the practical elimination of seepage. After 10 days of continuous test, there is still no evidence of percolation through the lining.

"Studies were continued in the Wilson Irrigation Company Canal near Ogden, Utah, with special reference to permeability of the soil in the bed of the canal.

"O. W. Israelsen and C. W. Lauritzen made a trip to St. George, Utah, stopping at Mount Pleasant, Richfield, Panguitch en route, and Cedar City, Fillmore, and Nephi on the return. Special attention was given to the need for lining canals owned by the Washington Field Irrigation Company. Operations of Soil Conservation Service contemplates extensive drainage of lands under this canal. It is believed that excessive seepage losses are contributing substantially to the need for drainage. Several sets of

piezometers were installed in Washington Field during Mid-November for the purpose of determining the extent to which water is flowing upward toward the soil surface due to pressure differences.

"Short conferences were held with Soil Conservation Service men at Mount Pleasant concerning canal lining and drainage; at Richfield concerning canal lining, consolidation of irrigation companies, and design of canals; and at Panguitch concerning re-design and location of canals, and also lining of reconstructed canal sections. On the return trip, conferences were held with Soil Conservation Service men at Cedar City concerning general irrigation improvements; at Fillmore with special reference to farm equalizing reservoirs, and construction of a new 12-inch diameter, two-mile concrete irrigation pipe line; at Nephi concerning canal lining and general irrigation improvements."

Hydraulic Studies at Corvallis, Oregon - A. W. Marsh reports: "Soil samples which had been brought in from the field were assigned numbers and prepared for laboratory analysis. Profile samples were subjected to mechanical analysis. Very little distinction in textural composition occurred between the bad and the good area except that the bad spots always have a layer of clay accumulated somewhere in the B horizon not found in the good spots. Silt ran rather high, 50 percent or over in most samples.

"Estimations of exchangeable potassium were made to round out the base exchange studies on the 1943 samplings.

"Laboratory percolation studies were initiated on disturbed profile samples using constant head permeameters in quadruplicate. Initial runs are showing good agreement between replications and marked differences between horizons."

Hydraulic Studies at McCredie, Missouri - B-2 - D. D. Smith reports: "Mr. Zingg is continuing his work on the flood-control effects of detention ponds and wildlife reservoirs on the Meramec River watershed. Several more months will be required for completion of the work."

Hydraulic Studies at Prosser, Washington - S. J. Mech reports: "The following tables summarize the season's data for the corn plots which were irrigated with application rates of q, 2q, and 3q. The "q" was that rate of application which reached the bottom of the 250-foot furrow in approximately two hours. It was subsequently adjusted so that it permitted only a sustained trickle of runoff. The 2q and 3q rates were respectively 2 and 3 times as large at all times.

"These summaries show that the rate of application has practically no effect on either the total or rate of infiltration. The increase in the rate of application merely increases the runoff.

"An increase in the rate of application did however increase the amount of moisture added to the upper four feet. It also improved the soil-moisture distribution along the furrow as indicated in table 2.

TABLE NO. 1

IRRIGATION SUMMARY FOR 1944 SEASON
Data Are Average of Triplicate Plots

Rate of application	Application	Runoff	Difference: Application - runoff	Runoff as portion of application	Soil loss	Moisture gain in upper four feet of soil		Average rate of: Application	Runoff	Infiltration
	inches	inches	inches	percent	tons/ac.	inches	% of appli.*	in./hr.	in./hr.	in./hr.
				Contour Plots (2% furrow grade)						
q	20.28	3.76	16.52	18.5	1.56	12.84	63.4	.41	.09	.33
2q	38.03	21.34	16.69	56.1	33.42	14.32	37.6	.76	.45	.33
3q	55.09	38.77	16.32	70.4	55.57	16.64	30.2	1.10	.80	.32
				Downhill Plots (7% furrow grade)						
q	20.40	7.06	13.34	34.6	17.69	11.37	55.8	.26	.10	.17
2q	40.32	26.94	13.38	66.8	49.13	12.54	31.1	.52	.36	.17
3q	59.55	44.32	15.23	74.4	65.87	14.90	25.0	.77	.58	.20

*Actually water-application efficiency.

TABLE NO. 2

1944 CORN PLOTS
Soil Moisture Gained in Upper Four Feet of Soil
Expressed in Inches for Irrigation Season

Application Rate	CONTOUR PLOTS				DOWNHILL PLOTS			
	Upper Half	Lower Half	Difference Upper-lower	Plot Average	Upper Half	Lower Half	Difference Upper-lower	Plot Average
q	13.47	12.21	1.26	12.84	13.82	8.92	4.90	11.37
2q	13.49	15.15	-1.66	14.32	15.52	9.56	5.96	12.54
3q	15.76	17.52	-1.76	16.64	16.96	12.84	4.12	14.90

Prosser, Washington

"The erosion increased as the rate of application was increased. This increase however was not proportional to either the increase in either the rate of application or the rate of runoff. The difference between the erosion from q and that from 2q was considerably greater than that between 2q and 3q.

"The influence of furrow grade on erosion was very great on the q application. This total soil loss for the four irrigations was 17.7 tons per acre on the plot with a furrow grade of 7 percent and only 1.6 tons when the furrow grade was reduced to 2 percent. The higher rates of application show a considerably lessened influence of furrow grade. The differences in the 2q and 3q runoff rates for the contour and downhill plots are no doubt a factor in this decreasing influence. The 2q runoff rate for the contour plots was .45 inch per hour and that from the downhill plots was .36 inch. For 3q the rates were .80 and .58 inch per hour for the contour and downhill plots, respectively."

Hydraulic Studies at the California Institute of Technology, Pasadena, California - Vito A. Vanoni reports: "The laboratory was visited by Mr. Frank Kimball, Head, Irrigation Division, Washington, D. C., and Mr. Karl O. Kohler, Jr., Regional Engineer, to discuss a program of investigation of hydraulic structures of importance in irrigation work. The structures of most immediate interest are the various types of irrigation-check structures. These are similar to the standard gully-drop structure which was studied at some length at this laboratory. It appears possible to apply some of the same principles to the irrigation structures that have been used so successfully in the gully-drop and other erosion-control structures."

Runoff Studies

Runoff Studies at Colorado Springs, Colorado - H. K. Rouse reports: "November precipitation averaged approximately 0.49 inch, almost all of which occurred during a blizzard on November 25. No runoff was recorded during the period. This blizzard served to emphasize statements in Weekly Weather and Crop Bulletin for the week ending November 21, 1944, concerning the difficulty in measuring snowfall, a portion of which follows: 'Local variations in topography are extremely important and the wind creates a special problem since it swirls the snow in and out of sheltered places and complicates the measurements.' Of eight recording gages exposed to the blizzard of November 25, six recorded no snow or negligible amounts. The other two, one of which contained an anti-freeze solution while the other was dry, caught excessive amounts with the snow packed tightly around the buckets and completedly filling the space surrounding the clock and weighing mechanism and even packed in the space between the inner and outer cases of a Friez type 6912 gage. Of six standard W. B. type non-recording gages, none retained any snow. Measurement of moisture in the snow remaining on the ground indicate a moisture content for the storm of from 0.40 inch to 0.50 inch.

"A study of the precipitation-runoff relationship on the 35-acre grassed watershed with heavy soils for the storm of July 15, 1944, indicates the great influence which vegetative cover has on runoff. The precipitation was the most intense, for periods up to thirty minutes, that has been recorded in the seven years this watershed has been under observation. Intensities of 3.60, 3.42, 2.96, 2.34, and 1.64 inches per hour were recorded, respectively, for intervals of 5, 10, 15, 20, and 30 minutes. This storm produced a peak rate of but 1.4 cubic feet per second from a 35-acre watershed. The total precipitation for the storm was 1.02 inches in 84 minutes. Total runoff was 0.04 acre feet, equivalent to 1.32 percent of the precipitation.

"The maximum rate of runoff recorded in seven years' observations was 38 cubic feet per second on July 21, 1940. This rate was produced by a storm with intensities of 3.60, 3.00, 2.56, 2.28, and 1.78 inches per hour, respectively, for the same time intervals of 5, 10, 15, 20, and 30 minutes. The total precipitation for the storm was 0.91 inches in 85 minutes. Total runoff was 1.16 acre feet, equivalent to 43.4 percent of the precipitation.

"Summarizing -- a storm averaging 5 percent less intense through the critical period with a total amount of rain 10 percent less produced runoff at a rate 27 times as great and in an amount 29 times as great.

"Analysis indicates this great difference is due principally to the vegetative cover. This watershed has native pasture cover and has been subject to controlled grazing since prior to the establishment of runoff studies, with grazing permitted only from about December 15 to May 15 of each year. The boundary of the watershed is defined by an artificial ridge. There has been no disturbance of topographic features. Both storms occurred at about the same time of year (July 15 and July 21) and at about the same time of day (peaks attained at 6:12 p. m. and 6:34 p. m.). Antecedent precipitation during the two weeks preceding runoff amounted to 1.96 inches in 1944 and 1.06 inches in 1940, and for the six months preceding, 7.96 inches in 1944 and 6.19 inches in 1940. Unfortunately, no comparative data are available as to soil-moisture conditions. With no significant differences in the physical characteristics, this leaves vegetation and changes in soil conditions induced by vegetation as the only probable causes of the startling variations in rates and amounts of runoff.

"The condition of vegetation in 1940 was not good. In 1938, in spite of better than normal precipitation, migratory grasshoppers cut back vegetation almost to the roots. In 1939, the total precipitation was but 5.24 inches, the minimum in a 72-year record, and native grasshoppers gave severe treatment to such vegetation as did develop. As a consequence many plants did not survive and the density of vegetation was sparse. Because of poor June precipitation, the volume of vegetation was also subnormal. In marked contrast, 1944 was a year of good growth and a marked recovery in density had taken place in the four years since 1940. Photographs of an established quadrat taken at the ends of the growing seasons of the two years, 1940 and 1944, indicate the great difference in both density and volume of vegetation.

"In order that unwarranted implications may not be drawn from this and similar records it may be well to mention that these effects of vegetation on runoff have been noted in the Western High Plains where mean annual rainfall varies from less than 10 inches to about 20 inches and with soils which, while comparatively shallow as to topsoil and subsoil, are deep with effective soil material. It is also important to note that almost all runoff in this area results from summer thunderstorms of high intensity but brief duration. These conditions are not conducive to a thorough saturation of the soil column which might nullify, in part the effects of the increase in vegetative cover."

Runoff Studies at Albuquerque and Santa Fe, N. M.; and Safford, Ariz. - J. H. Dorroh reports: "During the month work was completed on the 'Hydrologic Section' of the 'Regional Handbook.' Mr. Bamesberger, Regional Engineer, decided that inasmuch as so much delay had already been occasioned he would issue a provisional draft to the field prior to the receipt of all comments on the final draft. In order to receive the criticism of the local Weather Bureau personnel a draft was submitted to them for comment. Mr. Curtis, Chief forecaster, discussed the portion concerning meteorology with the writer and made several valuable suggestions. He further requested that that portion of the handbook be presented to the regular monthly forecasters meeting. This was done on November 3 and the following discussion was felt to be very satisfactory. At the close of the month the majority of the stencils had been cut."

Runoff Studies at Danville and Blacksburg, Virginia - T. W. Edminister reports: "Dr. C. R. Hursh of the Southern Appalachian Forest Service Station at Asheville, N. C., visited the project on November 9 and 10. Considerable time was spent in going over the Danville watershed research to obtain a picture of the water losses in that section of the Piedmont. The conclusions drawn were to be used by Hursh in preparing a report on resources for a fire-protection survey. A joint conference was held with Professor McGauhey, V. P. I. Hydrologist, to discuss the broader aspects of the hydrologic research needs of the State of Virginia.

"Some time was spent in discussing with Dr. Hursh the best possible locations and methods of installation of ground-water wells on the watersheds, both here and at Danville."

Runoff Studies at Fennimore, Wisconsin, and Edwardsville, Ill. - N. E. Minshall reports: "The period of November 7-15 was spent in the vicinity of Wausau making a reconnaissance of available gaging stations and attempting to select typical watersheds for the possible establishment of a series of runoff studies in the Big Eau Pleine drainage basin, which is a tributary of the Wisconsin River. An attempt was made to find different sized watersheds in order to study the effect of size of drainage area on rates of runoff. During this period an inspection was also made of the installations now in operation at the Rainbow Reservoir station near Rhinelander. These installations include rain gages, soil hygro-thermograph, anemometer, soil-moisture and temperature elements and snow-survey courses.

"A conference was held November 24 in Noble Clark's office to discuss the field inspection of conservation structures in Wisconsin. Present at this conference were Professors Zeasman, Muckenhirn, Ahlgren, and Lenz of the Experiment Station staff and Mr. Schweers, State Conservationist, representing the Office of Operations. At the close of the meeting Mr. Clark requested each one present to submit his ideas and suggestions to me and asked that I then prepare a report to include these ideas and send a copy to each, for his study before the next meeting. Letters have not yet been received from all of the parties concerned."

IRRIGATION DIVISION

Water Requirements for Irrigation

Irrigation Requirement Bulletin - Arthur A. Young and Willis C. Barrett, Pomona, Calif., report that preliminary research of available literature and initial conferences on procedure for preparation of a bulletin on irrigation requirements of crops have been undertaken. The results of the study will be made available to technicians and irrigators in Western areas. Conferences were held on this project with Mr. McLaughlin and Messrs. Blaney and Ewing.

Movement of Irrigation Water - D. W. Bloodgood, Austin, Texas, reports completion of stencils and graphs for a mimeographed edition of a report on Movement of Moisture in Soils, written by W. L. Rockwell while he was in charge of the Texas cooperative investigations. Despite its age, the information in the report is applicable to present conditions and by being made available more widely, is expected to assist in the further irrigation development of Lower Rio Grande Valley.

Kootenai Investigation - W. O. Rosebaugh, Bonners Ferry, Idaho, reports that the past season was exceptionally dry and the river very low. The effect on the organic soils in the valley was that all but the very lowest areas contained too little soil moisture to produce good crops. Only two light crops of alfalfa were cut and grain yields were generally light except in very low spots. Owing to water-supply forecasts based on the snow surveys for Kootenai River, a good deal of previously unreclaimed land was planted to crops, with good results.

Water Conservation - Harry F. Blaney, Los Angeles, Calif., attended a conference with D. A. Williams, Regional Chief, Division of Water Conservation,and Robert D. Perry, District Conservationist at San Fernando, Calif., relative to water conservation and irrigation studies in Antelope Valley. An outline, prepared by the Portland Office of Operations, was reviewed. It provides for a cooperative study of present water-land use; water requirements; stability of water supplies; improvement of ground-water supplies by recharge; and irrigation practices. For several years there has been an overdraft on the ground-water supply of the valley and the problem of conserving the available water supply is a serious one. Mr. Blaney and P. A. Ewing made a brief trip to the valley and later spent some time in planning a progress report to bring up to date the investigations the Division had made in the valley during the past 25 years. Mr. Tuckel will join them in this report.

Mr. Blaney attended a meeting at Beaumont, California, called by Karl Kohler and D. A. Williams of the Portland Regional Office, to consider irrigation and water-conservation problems in the Yucaipa, Beaumont, and Banning areas. After discussing the general water-supply situation in the two districts, the cooperative irrigation and soil-moisture studies conducted in Yucaipa Valley during the past year were reviewed and technical advice was requested before additional studies are started in the spring of 1945.

Problems of Different Areas - J. S. James, Billings, Mont., in reporting a trip over the Soil Conservation District near Torrington, Wyo., comments as follows: "This area illustrates the need for community or area consideration of factors affecting irrigation practice. There is apparently a need for surface drainage, at least, of the river-bottom lands. For this, and for properly coordinating farm-irrigation systems between farms, general topography should be available. The irrigation service available from each of the systems serving the area should be analyzed as to present service and improvements in service that might reasonably be anticipated under a community plan. It seems that both drainage and irrigation service are closely associated with the proper use of the soils."

Edward C. Gwillim, Corvallis, Oregon, in reporting a Klamath Falls, Oregon, Conference with SCS personnel on work in Langell Valley Soil Conservation District, comments as follows: "The Service is engaged primarily in land leveling. However, they would like to make some investigations regarding the water requirements and water use of the project. At some future date we will possibly be requested to assist them in carrying out some investigations of water use, water supply, and water requirements in the area."

Santa Ana River Evapo-Transpiration Investigation, Calif. - Dean C. Muckel, Pomona, Calif., is preparing a progress report of the first-season work - heavy November rains having stopped all gravity and pumping diversions for irrigation. A preliminary estimate of the consumptive use in Santa Ana Canyon below Prado Dam indicates 4,500 acre-feet annually, of which 3,080 acre-feet is used by native vegetation. Use for the entire area averages 2.64 acre-feet per acre. The 3,516-acre area was broken into 5 subdivisions, and consumptive use for each was estimated for the irrigation and non-irrigation seasons. An estimate was also made of the water which might be salvaged if this water table were lowered artificially to reduce the amount consumed by native vegetation. This amounted to 1,470 acre-feet a year. The latter information has been requested by water users in Orange County to indicate whether extension of the irrigation canals to Prado Dam would be justified in the interests of water conservation.

Evaporation from Water Surfaces - A. A. Young reports that results of a 5-year investigation at Fullerton, Calif., are now being stenciled for mimeographing. They include studies of monthly and annual evaporation coefficients for several types and sizes of evaporation pans as compared with a 12-foot pan; also studies of a small ground pan covered by a 1/4-inch screen which reduces evaporation nearly to that from a 12-foot pan; evaporation from salt solutions; and the effect of color of pan on evaporation loss.

Carl Rohwer, Fort Collins, Colorado, has prepared a discussion of a paper published in "Proceedings" of the American Society of Civil Engineers describing a new method of approach to the development of a rational evaporation law. In his discussion Mr. Rohwer checked the validity of the new theory by results of experiments by the Division of Irrigation at Fort Collins.

Farm Irrigation Procedures - Wayne D. Criddle, Boise, Idaho, on temporary detail to the Bureau of Reclamation for investigations dealing principally with the low water-penetration characteristics of some of the soils on Owyhee and Yakima (Rosa) projects, has worked out most effective farm-irrigation procedures for these soils.

Hydraulics of Irrigation

Silt Load of Texas Streams - Dean F. Bloodgood, Austin, Texas, conferred with U. S. Army Engineers regarding suspended silt problems of Texas streams. The Army Engineers desire a cooperation with the Division and will provide funds for additional work, which will be supervised by the Division.

Design and Invention of Irrigation and Drainage Apparatus - R. L. Parshall, Fort Collins, Colorado, reports limited tests on the small sand-trap model at the hydraulic laboratory. The probable recommended setting of the riffle vanes will be where the next adjacent will be 1 inch upstream from the transverse tangent line touching the preceding riffle; or, in other words, each riffle in the alignment will be set upstream 1 inch and the spacing between the riffles about 8 inches. The riffle has a turned-down lip at the top to prevent the eddying sand from being carried upward along the back surface of the riffle and sprayed off at a height well above the floor of the structure, thus being carried downstream beyond the influence of the active zone that moves the bed load laterally to the exit vent. The lip, as now formed, is fairly effective in preventing the loss of sand by such eddies. By observation it appears that some of the sand particles escape, showing that the lip is not yet shaped to realize full recovery of the bed load. The experimental riffles are cut from 20-gage copper sheet and quite easily formed into any shape desired.

Messrs. Kaupke, Gordon, Fay, and Martin, prominent irrigation men from Fresno, Calif., visited our hydraulic laboratory to learn more about sand traps and the Parshall measuring flume. These devices were demonstrated at the time of the visitation and Mr. Martin was given a set of plans covering the large riffle deflector sand trap at the head of the Minnequa-Union Ditch near Florence, Colorado, on the Arkansas River. Some of the irrigation companies along the Kings River in California may want to consider the use of the large riffle deflector-vortex tube type of sand trap in their canals.

Detailed drawings of three different types of sand traps have been prepared by the SCS Regional Office at Portland for use as illustrations in a short discussion covering the subject of sand traps.

Sources and Storage of Irrigation Water

Snow Surveys and Water-Supply Forecasts - R. A. Work, Medford, Oregon, prepared a report covering his observations and recommendations for changes in operating methods in the snow-survey work throughout the West.

J. C. Marr, Boise, Idaho, reports that Charles Johnson of the University of Washington was hired to make snow surveys on Snoqualmie Pass, Washington, and his equipment was turned over to the Forest Service District Ranger at North Bend, Wash. The snow-survey equipment and cabin supplies were sent to the Soil Conservation Work Group No. 5, at Pocatello, Idaho, which will take charge of the snow surveys on Portneuf River. Photographic copies of a number of our snow-course sketch maps were made. Final arrangements were made to hire George Emerson as a roving snow surveyor to be attached to our Boise office. He was to start work December 1.

R. L. Parshall reports that 1,000 small trail-marker signs are now available for distribution. The markers are made of 1/4-inch masonite board dipped in linseed oil, and consist of a red arrow painted on a yellow background.

E. H. Davis, Fort Collins, Colorado, reports that results of a questionnaire on "Relationship of Snow Surveys to Annual Water Resources," which was sent to all soil-conservation districts in that region, showed the need for 25 new snow courses in the interest of irrigation and flood control. Twenty-two of the 37 soil conservationists operating districts in Colorado, Wyoming, Arizona, and New Mexico, replied to the questionnaire. As time and weather permit, these areas will be investigated with the view to establishing new snow courses where deemed essential.

W. T. Frost, Medford, Oregon, reports computation and checking of all autumn watershed soil moisture for Oregon areas, and preparation of maps to be used in water-supply reports for the approaching season. First returns from questionnaires submitted to various soil-conservation districts indicate definite need for snow-survey and water-supply data.

Storage of Water Underground -

San Joaquin Valley Cooperative Project - Dean C. Muckel reports that operation of test ponds in San Joaquin Valley was continued during November. Several of the ponds have now been in operation continuously for over three months and one pond has had water uninterruptedly for 220 days. Acting as coordinator for the project, Mr. Muckel prepared a statement to the Central Valley Water Spreading Committee covering the results of the study as of December 1. The Committee is composed of representatives of the Division of Irrigation, Bureau of Reclamation, State of California, U. S. Salinity Laboratory, and two water-storage districts. It was pointed out in the statement that approximately seven months had now elapsed since the start of field work and the results so far obtained have been discouraging to large-scale spreading in San Joaquin Valley and particularly discouraging in those areas most needing ground-water replenishment. Percolation rates have decreased in most of the test ponds and in a few now amount to only two or three tenths of a foot a day. Search is being continued in the field and in the laboratory to ascertain the cause of the decrease in rates and to find some practical means of maintaining the higher initial rates.

Fred C. Scobey, Berkeley, Calif., reports that the month of November was spent in summarizing the plotted data on percolation rates on the San Joaquin Valley test ponds, and rearranging graphs to submit to the committee representing all interested parties, for discussion as to the program to be carried out in the year 1945.

Arthur A. Young, Pomona, Calif., reports that permeability studies have been continued at the Regional Salinity Laboratory, Riverside, Calif., but in smaller scope than previously, the number of cores being reduced from approximately 50 earlier in the year to 19 at the present time. They contain samples of undisturbed soil from the San Joaquin Valley varying in length from 14 to 34 inches held in steel or transparent lucite cylinders. Manometers are attached to each core at 6-inch intervals. Daily manometer readings and flow rates are plotted, flow being corrected for a standard temperature of 68° F. For the purpose of analysis the core is divided into different sections and permeability coefficients are calculated for each section and also for the overall length. Permeability in feet of depth per day is then plotted on semi-log paper as a record of permeability rates through the separate sections.

Santa Ana River spreading grounds - Mr. Muckel reports that a water-stage recorder was put in operation at the Parshall measuring flume at the headworks of the Santa Ana River spreading grounds on November 13. The diversion of water here is restricted by court stipulation and a continuous record of the water spread is required. Heavy rains, with snow in the higher altitudes, ended all irrigation in southern California and gave indication that most of the spreading grounds would soon be in operation.

Drainage of Irrigated Land

W. W. Fox, El Centro, Calif., reports concerning the Imperial Valley Drainage Investigation, that an additional 9" Parshall flume and 20 more piezometers were installed on the moisture-study plot east of Calexico and soil-moisture samples were taken on 11-3 and 11-14. The plot was irrigated on 11-15, the application on the land studied being 2.67". According to the farmer's standards this was a moderate irrigation; however, the moisture samples and water-table rise showed it to be excessive. Additional samples were taken on 11-20 and 11-28. During the irrigation, the depth of the water was observed every 10 minutes at 100-foot stations along the land. The plotted data give an excellent picture of the irrigation and show the surface-coverage time to vary from 70 minutes to about 200 minutes because of irregularities in the irrigation grade. Model Sump Run No. 5 was terminated after 47 days. It appears that organic growth in the filter sand may be retarding the flow. The installation is being used in a brief study of water-table relation to soil moisture as a check on tension-table determinations.

Reports were prepared by Carl Rohwer, Fort Collins, Colo., on the drainage pumping problems of Sauvie and Puget Islands in the Columbia River and the delta lands at the mouth of Skagit River on Puget Sound. A report covering the seepage problems of Juniper Flat District Improvement Company, which is located on the Deschutes River was also prepared. The suggestions for improving conditions on these projects are based on the investigation made in this area during October at the request of the Office of Operations, SCS.

San Fernando Valley, Calif. - At the request of D. A. Williams, Chief of the Regional Water Conservation Division. Harry F. Blaney attended a meeting of the Soil Conservation Serive staff at San Fernando to discuss drainage and flood-control problems in San Fernando Valley Soil Conservation District. A program for cooperating with the District, the Los Angeles Water Department and other agencies was outlined.

Irrigation Institutions

Utah Irrigation Company Study - J. H. Maughan, Logan, Utah, reports that the Utah Irrigation Company study is still largely in the field-work stage. In 24 of the State's 29 counties, a large majority of the companies have been interviewed and field data sheets filled out for these. Some follow-up work is being done to check further on the more important companies and to be sure that all companies are included. Satisfactory progress was made during the month of November by concentrating on this phase for short periods in each county. All outlying areas of the State have been covered, leaving only five close-in counties to be worked in December. However, these are the areas of greatest irrigation development and embrace much of the State's irrigated land as well as many organized companies. The help of cooperators in the field work has been quite satisfactory. In most cases county agricultural agents have assumed local supervision and done a good job. Excellent assistance has been rendered by personnel from field offices of SCS, FSA, and other participating agencies. In each county a representative of the Logan office has been present to initiate the work and assist with its direction, with editing of completed schedules and with other phases during a short period of intensive activity. The leader from Logan then went on to the next county, leaving completion of the work to the county agent and his helpers. With this organization, satisfactory progress is being made in nearly all areas. The company data sheets are being copied, either in the field or in the Logan office, to leave a set in the county agent's office. This will list all irrigation companies in the county and provide, for official use, a record of each company.

Hawaii Water Law Studies - W. A. Hutchins arrived in Honolulu November 15 to begin work under a cooperative agreement between the Department of Agriculture and the Honolulu Board of Water Supply. This agreement provides for a study of present physical conditions affecting artesian-water supplies in the Territory of Hawaii, with a view to suggesting legislation for coordinating present and prospective uses of the water. War conditions have created unprecedented demands upon the artesian-water supplies of Oahu, particularly in the Honolulu area, and existing legislation appears inadequate for protection against serious loss of head and resulting salt encroachment. Conferences have been held with the Board of Water Supply and its technologists, and with Federal and Territorial officials and private parties. In addition, a number of field trips have been made to pumping plants and other diversions in the critical areas. It is expected that the work in the Territory will be completed by the middle of December.